

PCTWORLD INTELLECTUAL PROP
International F

INTERNATIONAL APPLICATION PUBLISHED UNDER

(51) International Patent Classification⁶ :

H04N 7/08

A1

(11) L

WO 9608923A1

(43) International Publication Date:

21 March 1996 (21.03.96)

(21) International Application Number: PCT/SE95/01056

(22) International Filing Date: 18 September 1995 (18.09.95)

(30) Priority Data:

9403109-3

16 September 1994 (16.09.94) SE

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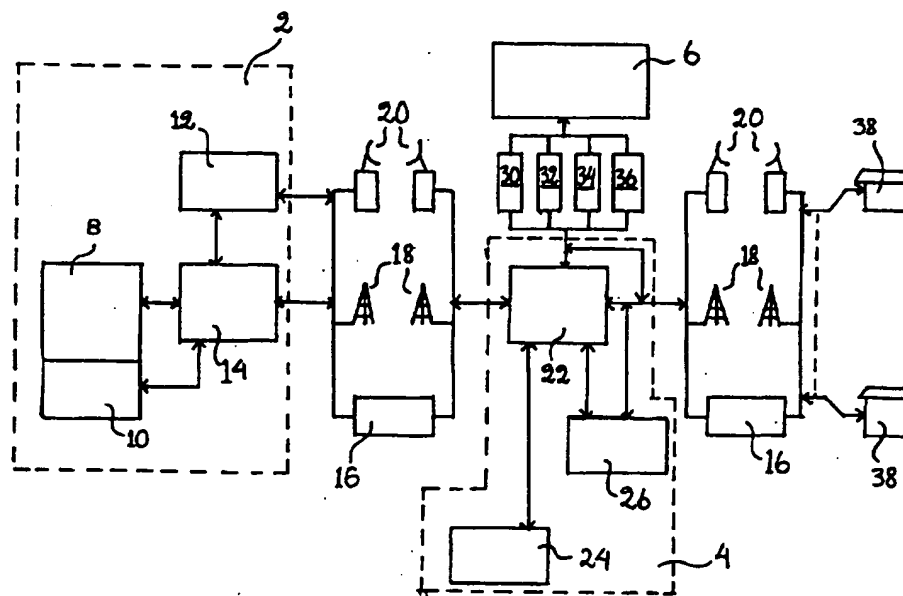
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(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG).

Published*With international search report.**Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.*

(54) Title: APPARATUS AND METHOD FOR LOCAL INSERTION OF MATERIAL IN BROADCASTING

**(57) Abstract**

A method, system and apparatus for insertion of additional material into a TV channel television signal being broadcast from a central source (2) and received by a remote receiver (4) adapted for rebroadcasting said television signals to a number of end user units (38).

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Apparatus and method for local insertion of
material in broadcasting

Field of the Invention

The present invention relates to apparatus and methods for local insertion of analogue or digital material, such as audio/video advertisement, in analogue and digital broadcasting.

5 Background of the Invention

Advertising in television broadcasting has traditionally been an exclusive field for large companies on national or multinational level. The reasons have i.a. been found in high producing costs for commercials and, perhaps above all, in the fact that a very large number of consumers are reached in one broadcast and thus motivating a high price per broadcast commercial. Declining producing costs and an increasing number of rebroadcast systems, such as cable television systems and the like, targeting limited consumer groups that are integrated e.g. geographically or by virtue of interest have given rise to a need for inserting locally broadcast commercials in conveniently arranged slots in wide area broadcast television channels. This would e.g. allow large companies to insert information about local dealers into centrally produced commercials or small companies to afford locally broadcast commercials into a medium which in practice has been previously closed.

Prior Art

20 Advertising insertion systems have evolved from analogue insertion systems described for example the documents US Patent 4,724,491 to Lambert, US Patent 5,060,068 to Lindstrom and WO 93/10630 of Keene with video tape recorders playing commercials and being switched on in response to cue in signals broadcast in the main television signal. These analogue and partly mechanical systems present problems concerning reliability in the segueing of an advertisement segment into the main television signal or vice versa.

25 Other problems in this field concern the transmitting of additional television signals to be inserted into a main television signal from a central site to a remote site, and the monitoring and logging of additional signals that actually have been inserted and

broadcast. These and related problems are dealt with in the US Patent to Esch and in the European patent application EP-A1-0 620 689 of Lambert.

A digital insertion system is shown in WO 93/21732 of Fasciano et al. This document describes a system comprising an apparatus for digitizing, compressing and storing audio/video source information, a playing apparatus for decompressing the source information and regenerating an analogue signal and a patching apparatus adapted to insert the regenerated analogue signal into a broadcast channel. Different general configurations and compression schemes are described.

10 Problems in Prior Art

Problems in prior art concern i.a. reliability in synchronizing and cueing additional signals into a broadcasting or other communication channel, and reliability in remote control of insertion apparatus. In particular it is a problem to achieve a technical implementation that satisfies reliability requirements to a cost which is reasonable to a larger group of advertisement buyers.

Objects of the Invention

It is a overall object to achieve an insertion system which allows a flexible and reliable remote control of insertion equipment and which provides reliable timing, cueing, synchronizing and playing of insertion material. A particular object is to provide such a system in a digital implementation, with a high degree of integration of functional units and at a low cost. Another object is to provide such a system which makes use of existing broadcast system resources without interfering with other broadcast or communicated material and which is transparent to other system users.

These and other objects and advantages are accomplished by means of a system, apparatus and method with the features of independent claims 1, 6,9 and 12, respectively. Further features and embodiments of the inventive concept are indicated in the dependents claims.

30 Brief Description of the Drawing

The inventive concept will now be described by means of an embodiment of the invention and with reference to the figures of the accompanying drawing.

Fig 1 is a schematic illustration of a broadcast system incorporating the inventive

insertion system and showing a central site and a headend site of a remote rebroadcast system;

Fig 2 is a schematic illustration of an embodiment of a central control apparatus provided in a central site according to Fig 1;

5 Fig 3 is a schematic illustration of an embodiment of a local insertion control apparatus provided in a remote headend site according to Fig 1;

Fig 4 is a schematic illustration of an embodiment of a cue in apparatus comprised in a local insertion control unit according to Fig 3; and

10 Fig 5 is a schematic illustration of an embodiment of a signal changeover means comprised in an embodiment of a cue in apparatus according to Fig 4.

Description of Embodiments of the Invention

Fig 1 shows a schematic illustration of a broadcast system comprising means for local insertion of additional material into a main broadcast signal. For example a central
15 TV station (2) for broadcasting one or several TV channels is coupled via e.g. conductive or optical transmitting means 16, aerials 18 for terrestrial wireless transmission or parabolic aerials 20 for transmission via satellite to one or several remote headend stations 4 for rebroadcasting a television signal from the central TV station. The headend station 4 is integrated in a rebroadcast system using e.g. conductive/optical 16, terrestrial
20 wireless 18 or satellite transmission 18 means for rebroadcasting the television signal to TV consumers 38. A headend station 4 may also be coupled to a service and/or control station 6 where additional material to be inserted in predefined slots of the main television signal, such as local commercials in the form of audio and/or video segments, text, characters, data or control information, may be produced, encoded or compressed.
25 The additional material may be transmitted to the headend station 4 e.g. by means of satellite communications 30, telephone/modem communications 32, ISDN 34 or manual or mechanical conveyance 36.

The central TV station 2 is provided with a central control unit 14 for controlling the insertion of additional material. The central control unit 14 is coupled to broadcast
30 equipment 8 for TV channels, i.e. one or several main television signals, to storage means 10 for storing a central play list containing information about the main television signal, central commercials and predefined slots for central and local insertion of additional material. Central insertion of additional material may be controlled by the

central control unit 14 or any other insertion equipment comprised in or coupled to the broadcast equipment 8.

The central TV station of Fig 1 comprises a per se known broadcast equipment 8 coupled to a central control unit 14, wherein an output broadcast television signal from said broadcast equipment 8 is input into the central control unit 14. Said central control unit 14 is adapted for controlling the insertion of a media segment, which is a section of information represented e.g. in the form of audio, video, software, stills or data signals. An embodiment of the central control unit 14 comprises control software, a cueing generator and possibly a modem for data communications. Different embodiments of the central control unit are operated by means of menu software using a keyboard or a customized control panel, or by means of an existing automatic control system.

The remote headend station of Fig 1 comprises a remote control unit 22 coupled to remote control means 26 and storage means 24 for storing a local playlist, additional material or media segments to be inserted, log files and status information. The mentioned means 22,24,26 are coupled to a not shown television signal receiver and a not shown rebroadcast equipment. The remote control unit 22 may itself be controlled either through the remote control means 26 or through insertion control signals incorporated in the broadcast television signal received by the headend station. By means of the communications means comprised in the described system, a network may be formed between a central site (2), a remote site (4) and compression and/or decompression means located at a separate site.

The method for insertion comprises the steps of:

1. Producing or compiling a media segment;
2. Defining a scheduled slot, i.e. a portion of time in a broadcast which can be allocated for insertion of a media segment or a block, which is a number of consecutive media segments;
3. Transferring a media segment to and storing it in the remote headend station 4;
4. Notifying the central TV station 2;
5. Centrally planning and controlling the insertion of each media segment by means of the central control unit 14;
6. Encoding a cue in signal into a broadcast television signal;
7. Broadcasting/communicating said television signal comprising said cue in signal to remote headend stations 4;

8. Inserting, at a headend station 4, in response to said encoded cue in signal, said stored media segment in said defined slot;
9. Broadcasting said media segment to TV consumers 38;
10. Rebroadcasting said television signal to TV consumers 38;
- 5 11. Communicating possible operating errors or logging information from remote headend station 4 to central TV station or monitoring center.

Fig 2 shows an embodiment of a central control unit 14 for scheduling insertion of additional material, said central control unit comprising a central processing unit (CPU) platform 48 being able to execute multitasking control and logging software 50. Data
10 storage means 42, e.g. a magnetic or optical disc, is coupled to the CPU 48 via a storage means interface 44. Monitoring circuits 46 and a signal encoder 40, e.g. a teletext encoder, are mutually coupled as well as coupled to the CPU 48. A conventional studio television signal output 66 is coupled to said signal encoder 40 for encoding insertion control signals into the television signal, which after encoding is fed to an insertion
15 encoded television signal output 68 for conventional broadcasting. Also coupled to the CPU 48 are data communications means 54, e.g. modem or ISDN equipment, which is connectable to external communication means 62, and serial input/output ports 56 being connectable to external serial interfaces 64. For an optional interface between the central control unit 14 and a human operator a keyboard 52, a display means 58 or control
20 switching means 60 are connectable to the CPU 48.

For controlling a number of remote control units 4, one embodiment of the inventive system operates by means of a signalling method using the vertical blanking interval VBI of a television signal. In one preferred embodiment the inventive method involves using only one user selectable line of the VBI and the signals may typically
25 have up to 10 EXP 14 different codings with full error checking. To their form the signals used in this method are Teletext compatible but are transparent to standard Teletext receivers. Such control signals are locked to the television signal, and are thus available any time a television signal itself is available. Controlling commands from the central control unit 14 to a remote control unit 22 may also be transferred through
30 VSAT, ISDN or modem, and in most cases signals being sent in return to the central control unit 14 would be transferred through ISDN or modem. In one embodiment signals used to achieve an insertion comprise firstly, a cue signal transferring information about playlists for different remote control units 22 and secondly, an action signal for

triggering an insertion of a predefined media segment.

In a preferred embodiment of the VBI transferring method the control signals are Hamming coded for data security. The data structure of control signals may be configured with data comprising:

- 5 1. Clock run in specification;
2. A framing code;
3. Data channel specification;
4. Designation code;
5. Security access code;
- 10 6. Format signal;
7. Action signal;
9. Parameters.

The inventive system comprise functional means for performing the following steps in response to corresponding control or command signals.

15 For media segment player means:

1. Cueing in a block of additional material;
2. Playing or broadcasting a cued block;
3. Stopping a currently played block;
4. Holding a currently played block;
- 20 5. Releasing a currently played block;
6. Cancelling a stored block.

For insertion system units:

1. Resetting selected remote control units 22;
2. Setting time and date;
- 25 3. Downloading current log file to central control unit 14;
4. Selecting a defined remote control unit 22 to listen to next command;
5. Setting conditions, e.g. if and when, for remote control units to verify commands and operations with the central control unit 14.

For data transfer units controlling transfers of large amounts of data, e.g. additional
30 material, playlists, program updates:

1. Initiating data transfer;
2. Ending data transfer;
3. Identifying data blocks.

For controlling data file storage means:

1. Identifying or confirming existing file;
2. Deleting files;
3. Copying files;
- 5 4. Moving files;
5. Renaming files;
6. Retrieving directory of files.

The remote control units 22 (Fig 1) are configured as multichannel units with the ability of changing input and output channels dynamically. In an example, an input
10 channel refers to a monitoring channel, while an output channel is the channel into which additional material is inserted. The remote control unit 22 has an interface both to internal insertion means and to external equipment comprised in a rebroadcast station. For monitoring and controlling said external equipment, the remote control unit 22 comprises functional means for:

- 15 1. Setting an input switch controlling an input channel;
2. Setting an output switch controlling an output channel;
3. Setting an analogue switch;
4. Setting a relay;
5. Setting user bits showing user status;
- 20 6. Reading monitor bits showing predefined the status of predefined units.

Command parameters used in connection with said control signals comprise a timestamp and a playlist identity including an indication of one or several of the following items: year, month, day of month, hour, minute, second and block number.

Fig 3 shows an embodiment of a remote control unit 22 comprising an insertion
25 control unit 76 coupled to a signal switching means 74 which also is coupled to an analogue or digital insertion signal recorder and/or player 80 comprising genlock circuits. The insertion player 80 is preferably provided with means for signal or data compression/decompression, e.g according to an MPEG-2 or a JPEG system. The switching means 74 is adapted to switch to broadcast television output in case of system
30 failure. The mentioned units 76, 74 and 80 are further coupled to and controlled by a central processing unit (CPU) platform 70 being able to execute multitasking control and logging software 72, and the insertion control unit 76 may also be provided with an input/output port 112 for external control and monitoring signals. A remote control unit

22 may be configured to be able to handle several different incoming television signals for different TV channels. In operation, a television signal comprising an video signal 96 and an audio signal 98 is input into the signal switching means 74, a connection 110 is provided for conveying the video signal to the insertion control unit 76, a genlock video
5 signal 104 is conveyed to the genlock circuits of the insertion signal player 80 and an insertion video signal 100 as well as an insertion audio signal 102 being genlocked with the original television signal are transferred to the signal switching means 74. The received broadcast television signals 96 and 98 are rebroadcast through video output 106 and audio output 108, and in response to a cue in signal transmitted together with said
10 television signal 96 or 98, the signal switching means 74 switches over to rebroadcast said inserted audio/video signals 100,102 for a predefined time interval.

Embodiments of the remote control unit 22 further comprise, interconnected or coupled via the CPU 70, a storage means 82, e.g. magnetical or optical, a storage means interface 84, data communications means 78 connectable to external communications 114
15 such as modem, ISDN or VSAT, monitoring means 88, additional facility means 86, e.g. local Teletext, serial input/output ports 92 and display means, e.g. LCD display 90 or video monitor 94.

Fig 4 shows an embodiment of the insertion control unit 76 provided with a computer interface 120 comprising address decoding circuits, interrupt control circuits
20 and read/write circuits allowing a connected computer processor to communicate with units coupled to said interface 120. An embodiment of the computer interface is implemented by means of generic array logics (GALs) and part of a field programmable gate array (FPGA). The insertion control unit 76 further comprises a video input switch 116 for selecting, from a number 1-N of received input signals/channels 144, a signal
25 from which data should be encoded. The video input switch 116 may be controllable by means of a connected computer 70 (FIG 3) or by means of control data received through any other communications device. The main purpose of the switch is to allow a number of channels to be monitored without duplicating receiver and decoding means in the headend station. In another embodiment different VBI lines may be allocated to different
30 TV channels, so that each TV channel can be sampled at least once a frame. In that case, the channels would normally have to be sync locked together.

A video output 146 is used for genlocking insertion material recorder and player, and other devices of the system. The video output 146 is also input into a pulse generator 118

for generating pulses from the selected video signal. These pulses are then transmitted to and used by other functional units comprised in the system, e.g. synchronizing and blanking means.

A Teletext/data broadcast receiver 124, possibly implemented in an FPGA, is coupled to the computer interface 120, a random access data storage means 122 and an error checking/correction means 126. As has been explained above, initial data transmitted using a line of the VBI is utilized as an independent data channel as specified by the Teletext specification, whereas other functional data, e.g. cueing, playing, logging, crosschecking and playlist information, is transmitted in a Hamming coded data format. The receiver 124 extracts data from the video signal and validates the initial data for correctness. If valid data is detected, the additional information is sent the error checking/correction means 126 for checking and possible correction before validated data is stored in the storage means 122. The receiver 124 controls the storage of received data in the storage means 122.

An audio/video changeover means 132 for switching from rebroadcasting a received television/channel signal 144 to an insertion signal 148 from an insertion material player. The audio/video changeover means 132 is i.a. coupled to the computer interface 120.

The insertion control unit 76 may further be provided with a data comparator 130 coupled to a non volatile storage means 128, which may be preloaded with a block of data from the CPU 70 (FIG 3) for allowing a real time comparison with the decoded data as it is received.

For achieving integration of insertion system units into existing rebroadcast systems and controlling external devices by means of the CPU 70 (FIG3), embodiments of the insertion control unit 76 may be provided with one or several relays 134 used to turn on and off various devices comprised in the system, control switches 136 and status indicators 138. Said devices 134, 136 and 138 are coupled to the computer interface 120 and to a general purpose interface 142. For various purposes, a serial interface, e.g. RS232, may also be coupled to the computer interface 120.

An embodiment of an audio/video changeover means 132 is shown in Fig 5 comprising a computer interface 152, a number 1 to N five signal routes audio/video switches 154 coupled to said computer interface 152 and an unbalanced to balanced converter 156 coupled to said audio/video switches 154. The audio/video switches 154 allow insertion of additional material signals comprising insertion video signal (IV), first

channel insertion audio signal A (IA A) and second channel insertion audio signal B (IA B) into a number N TV channels. The insertion is controllable by means of a CPU 70 (FIG 3) or directly from integrated teletext control signal or command detection. As mentioned above, insertion audio signals from a insertion material player is input in two channels A and B, which may be stereo or two different languages. In order to maintain normal broadcast quality, balanced or differential audio signals are generated in said changeover means 156 by means of a comprised converter and signals A+,A-,B+,B- are output and transmitted to the audio/video switches 154. Said audio/video switches are each provided with one video switch and four audio switches, which change simultaneously from the input TV channel signals V,A+,A-,B+,B- to the corresponding insertion signals IV, IB and IA signals in response to insertion control signals. Said changeover means 132 is preferably provided with a real time switching means for separately switching the video signals in order to allow centrally broadcast vertical interval data to pass through unchanged. The default condition is for all switches to pass their respective TV channel signals unchanged.

The insertion control unit 76 may further be provided with a data comparator 130 coupled to a non volatile storage means 128, which may be preloaded with a block of data from the CPU 70 (FIG 3) for allowing a real time comparison with the decoded data as it is received.

Couplings and signal transmitting routes between functional units of the inventive system are apparent from the drawings.

Claims

1. A system for insertion of additional material into a TV channel television signal being broadcast from a central source (2) and received by a remote receiver (4) adapted for rebroadcasting said television signals to a number of end user units (38),
characterized in

5 central insertion control means (14) for centrally controlling the insertion of said additional material, said central insertion control means being coupled to broadcast equipment of said central source and being adapted to incorporate a control signal and an information signal into said television signal; and in

10 remote insertion control means (22) for locally controlling the insertion of said additional material, said remote insertion control means being coupled to rebroadcasting equipment of said remote receiver (4), being adapted to detect control said control signals and information signals in a received television signal and being adapted to rebroadcasting said additional material in response to said control signal for a predefined time interval.

15 2. A system as recited in claim 1, **characterized in** a first remote control means (12) coupled to said central insertion control means (14) for remotely controlling and communicating with said central insertion control means;

20 a second remote control means (26) coupled to said local insertion control means (22) for remotely controlling and communicating with said remote control means (22);
and in that

communication with said remote control means (12,26) and said insertion control means (14,22) is performable by means of communications means (16,18,20).

25 3. A system as recited in claim 1 or 2, **characterized in** that said central insertion control means (14) is operating in response to central playing schedule information.

30 4. A system as recited in any of the preceding claims, **characterized in** that said remote insertion control means (22) is coupled to storage means (24) for storing additional material, play lists, log files and status information.

5. A system as recited in any of the preceding claims, **characterized in that** a central insertion control means (14), a local insertion control unit (22) and possibly a separately located compression and/or decompression means for compressing and/or decompressing information are connectable into a network by means of said communications means (16, 18,20).

6. An apparatus for central insertion control (14) interconnectable with a system for insertion of additional material into a TV channel television signal being broadcast from a central source (2) and received by a remote receiver (4) adapted for rebroadcasting said television signals to a number of end user units (38), **characterized in a storage means** (42) for storing control information as well as additional material information and logging information;

a processing means (48) for controlling and monitoring said insertion and being coupled to said storage means (42);

an encoding means (40) for encoding control signals and information signals into a broadcast television signal, said encoding means being coupled to said processing means (48).

7. An apparatus as recited in claim 6, **characterized in that** said encoding means (40) comprises a teletext encoder.

8. An apparatus as recited in any of claims 6 or 7, **characterized in data** communications means (54) for external communication and serial interface means (56,64) for connection to external devices, said data communications means (54) and said serial interface means (56,64) being coupled to said processing means (48).

9. An apparatus for local insertion control (22) in a system for insertion of additional material into a TV channel television signal being broadcast from a central source (2) and received by a remote receiver (4) adapted for rebroadcasting said television signals to a number of end user units (38), **characterized in a processing** means (70);

a storage means (82) for storing additional material and being coupled to said processing means (70);

a playing means (80) for playing stored additional material and being coupled to said processing means (70) and said storage means (82);

a television signal switching means (74) for switching between rebroadcasting received television signals (96,98) and additional material being played by said playing means (80), said additional material being input into said switching means (70) as television signals (100,102); and

an insertion control means (76) being coupled to said switching means (74) for controlling it, said insertion control means having an input for receiving the video signal portion of a broadcast video signal, from which a control signal is extractable.

10. An apparatus as recited in claim 9, **characterised in** that it comprises genlocking means (81) having an input 104 for receiving a broadcast video signal and being coupled to said playing means (80) for genlocking its output signal to said received video signal.

11. An apparatus as recited in any of claims 9 or 10, **characterized in** that said insertion control means comprise a processor interface (120) being connectable to said processor means (70);

a teletext and/or data broadcast receiver (124) being coupled to said computer interface (120);

an audio/video changeover means (132) for switching from outputting a received television signal to outputting an insertion signal from a insertion material playing means (80), said changeover means being coupled to said computer interface (120).

12. A method for insertion of additional material into a TV channel television signal being broadcast from a central source (2) and received by a remote receiver (4) adapted for rebroadcasting said television signals to a number of end user units (38), **characterized in the steps of:**

producing or compiling a media segment;

defining a scheduled slot, i.e. a portion of time in a broadcast television signal, - which can be allocated for insertion of a segment or a block of segments of additional material;

transferring an additional material segment to and storing it in the remote headend

station (4);

notifying a central TV station (2) that said additional material segment has been stored in said headend station (4);

centrally planning and controlling the insertion of each media segment by means of
5 a central control unit (14);

encoding a cue in signal into a broadcast television signal;

broadcasting/communicating said television signal comprising said cue in signal to remote headend stations (4);

inserting, at a headend station (4), in response to said encoded cue in signal, said
10 stored additional material segment in said defined slot;

broadcasting said media segment to TV consumers (38);

rebroadcasting said television signal to TV consumers (38);

communicating possible operating errors and/or logging information from remote headend station (4) to central TV station or a monitoring center.

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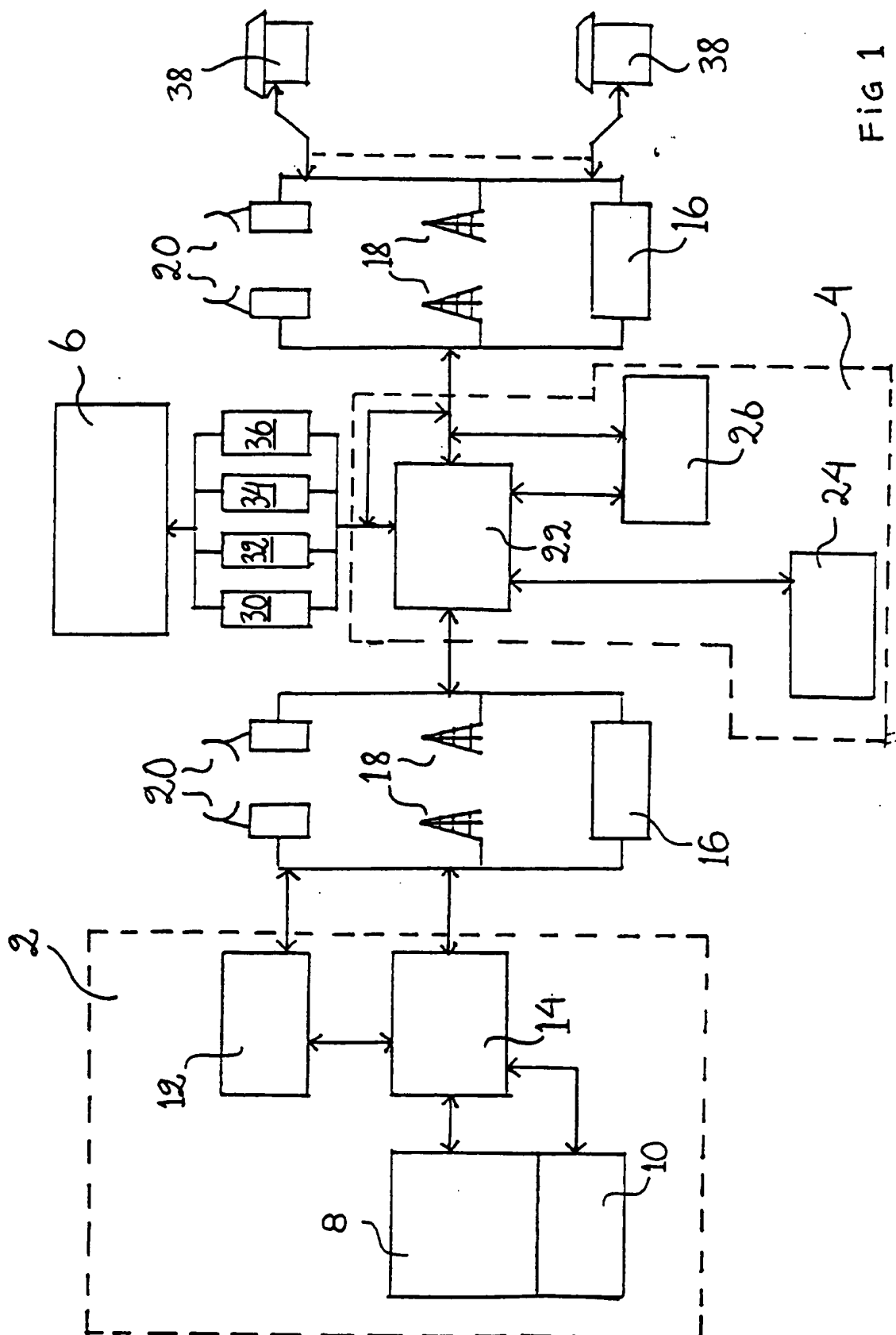


Fig 1

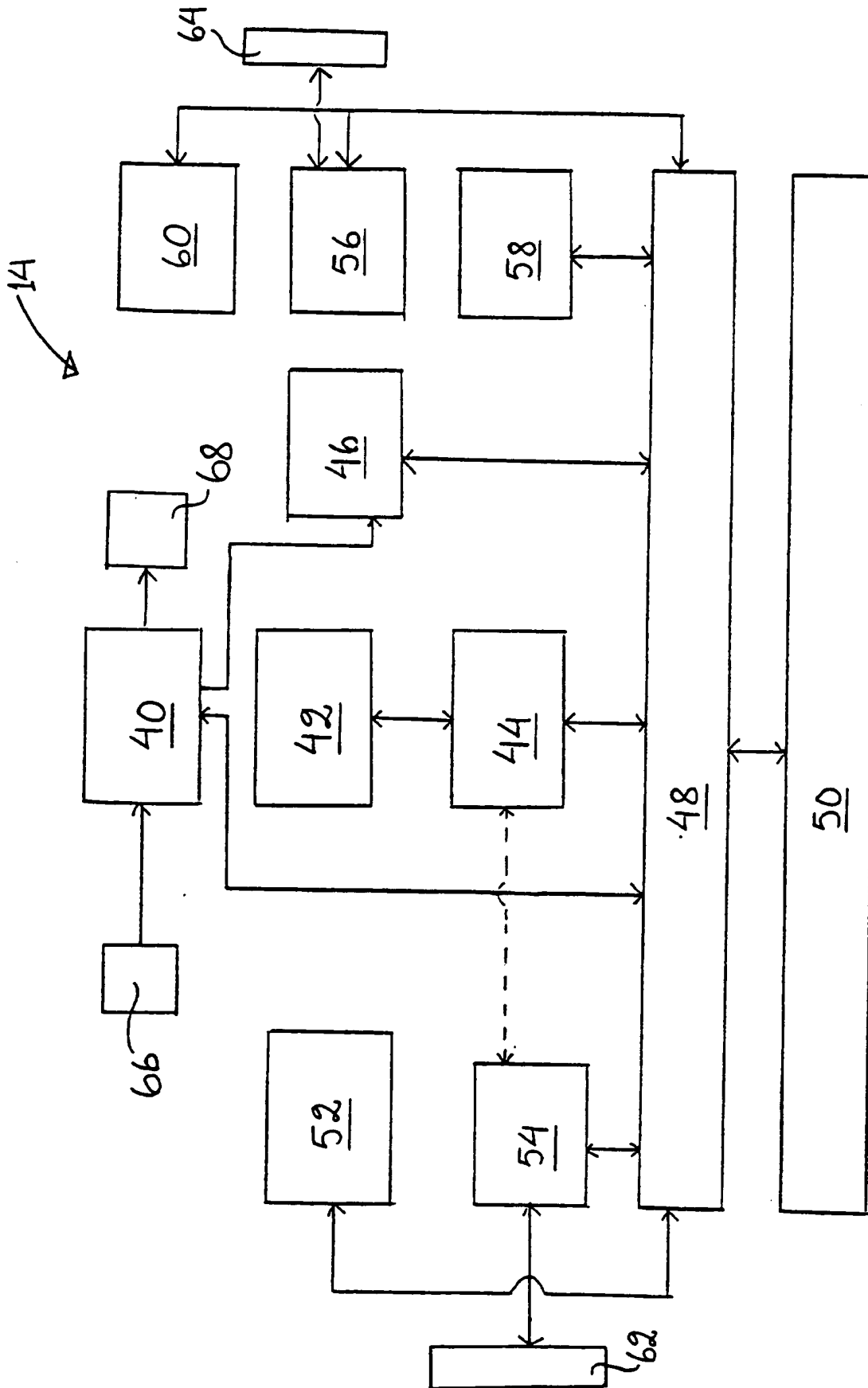


FIG 2

22

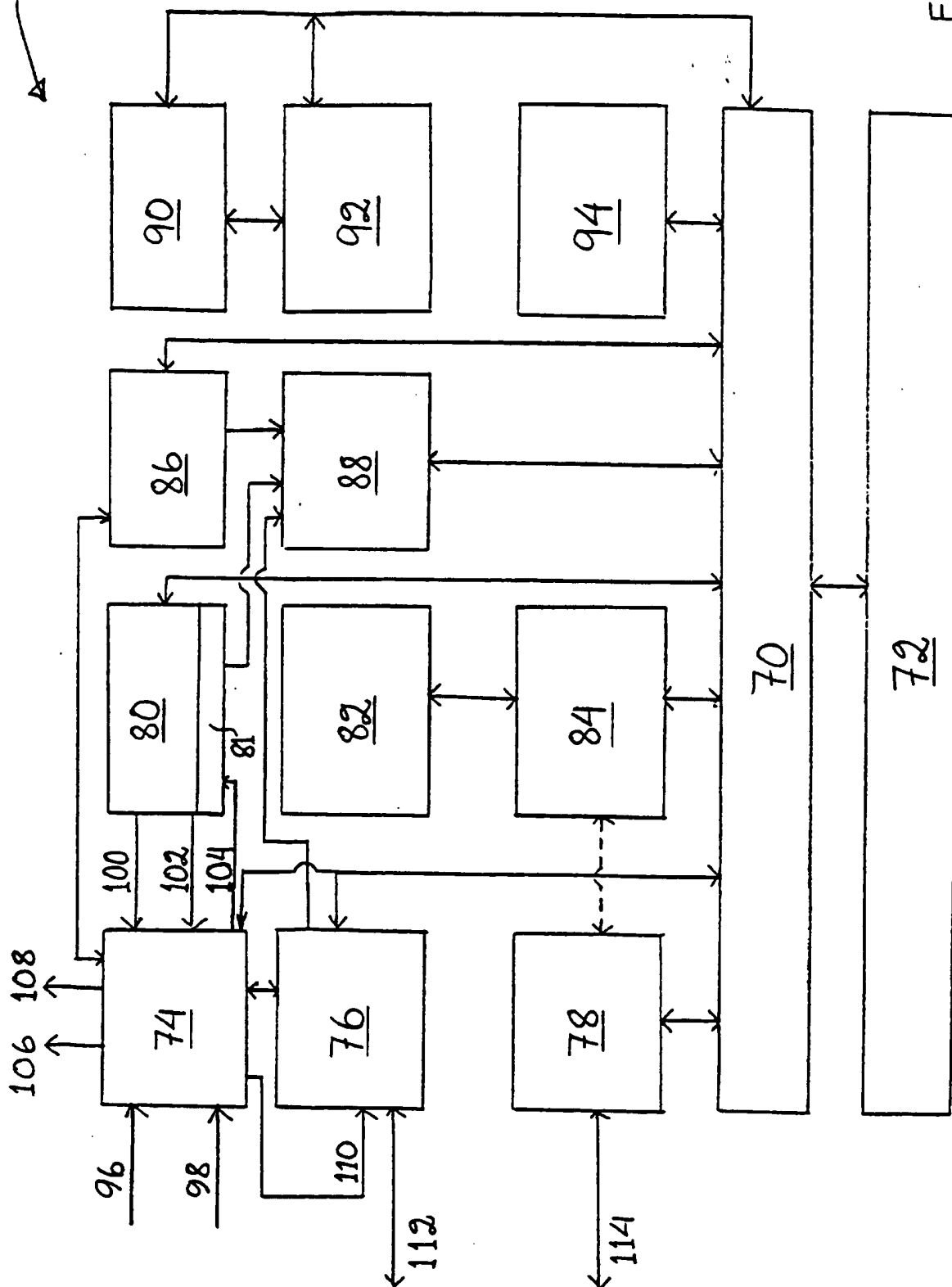


FIG 3

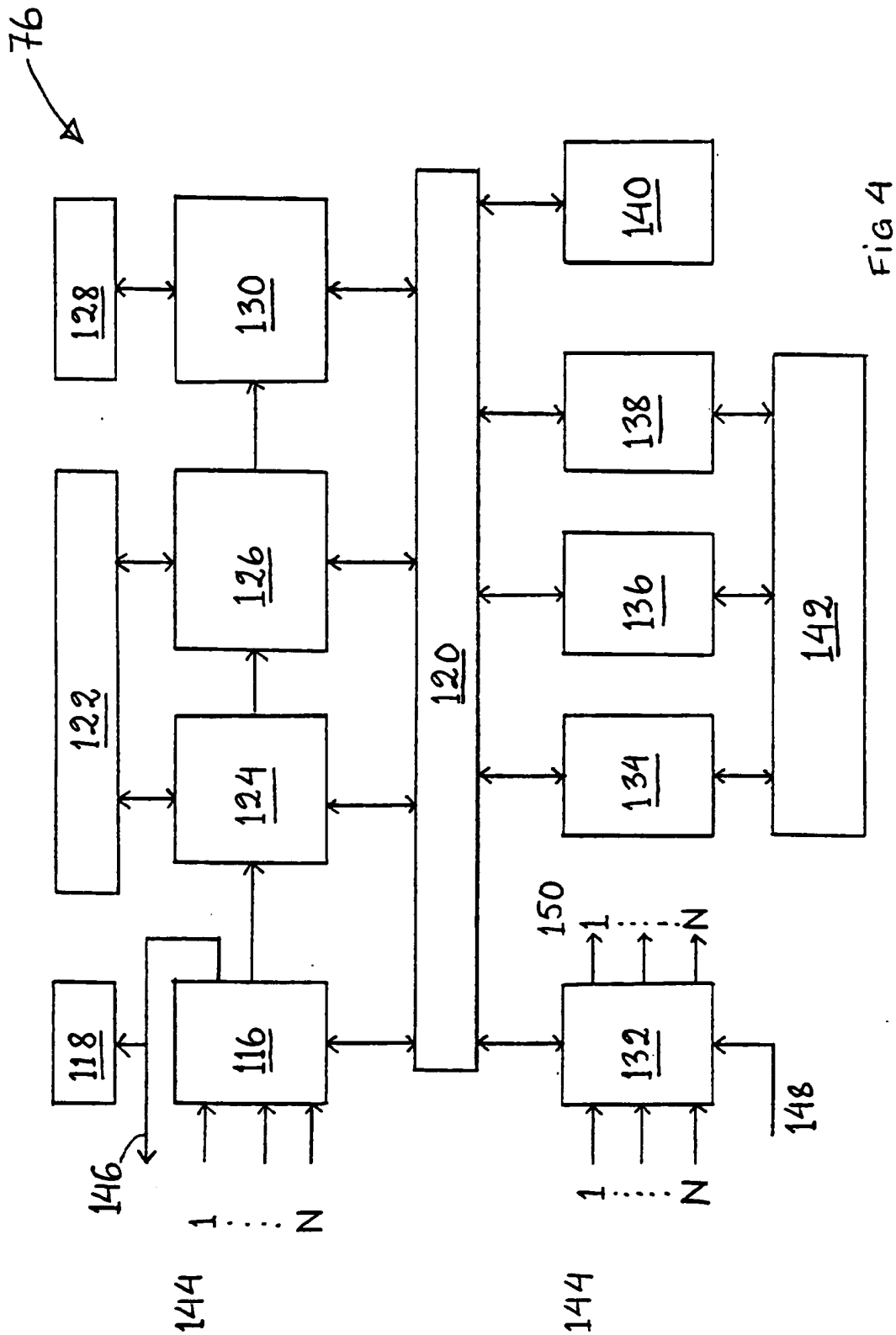


Fig 4

5 / 5

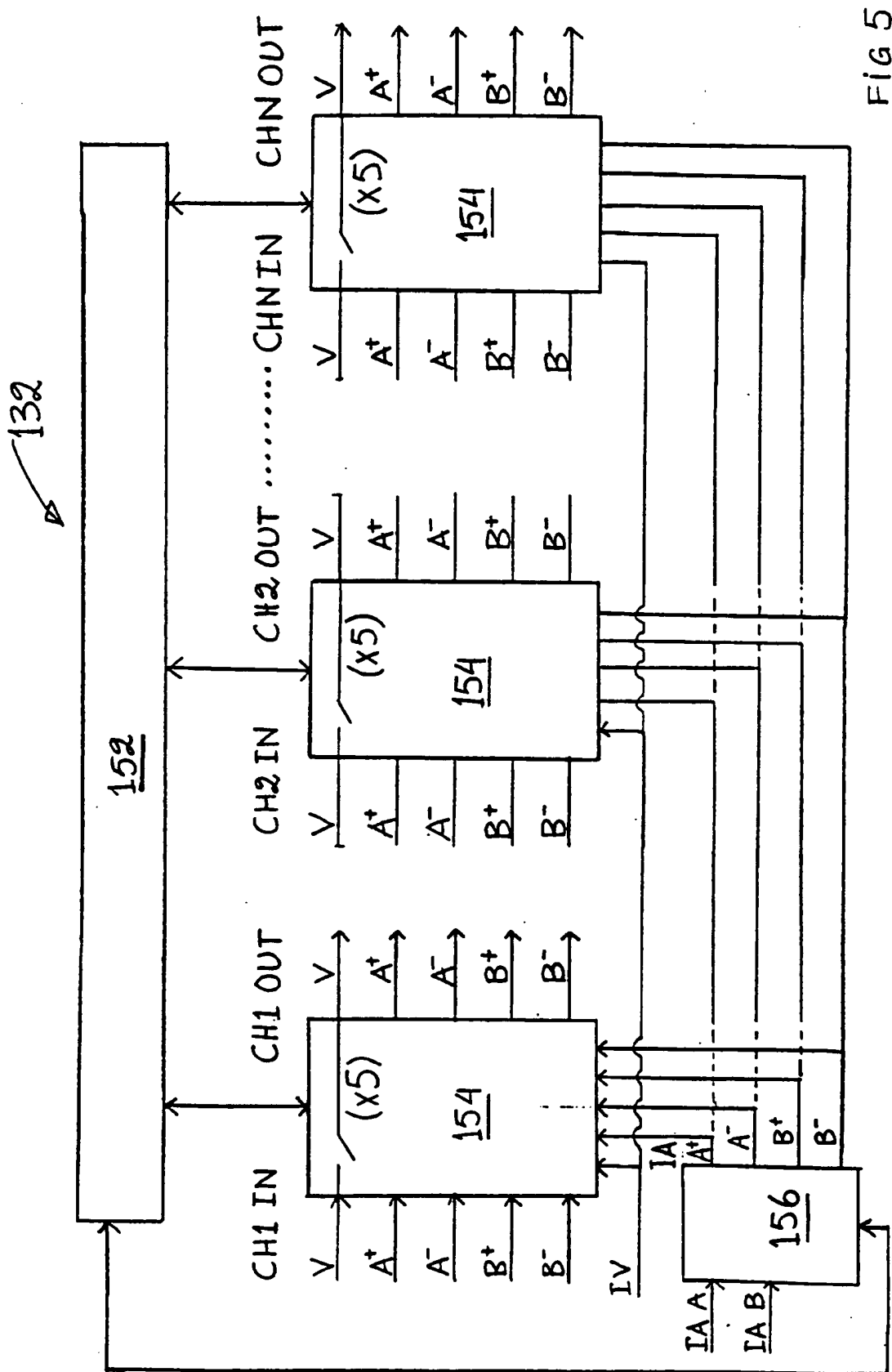


Fig 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 95/01056

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04N 7/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	EP 0620689 A1 (CABLE SERVICE TECHNOLOGIES), 19 October 1994 (19.10.94), claim 1, abstract, Mentioned in the application	1,2,5
P,A	--	3,4
X	US 4814883 A (MICHAEL C. PERINE ET AL), 21 March 1989 (21.03.89), column 9, line 12 - line 34; column 11, line 10 - line 41; column 12, line 24 - line 29, abstract	1-3
Y	--	10
A	--	4,5



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

25 January 1996

Date of mailing of the international search report

29 -01- 1996

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International application No.

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